MODULE G PRACTICE SESSION

You perform the following hemodynamic and blood-gas measurements on a 35 year old woman admitted with viral pneumonia:

	ARTERIAL	VENOUS
pH	7.23	7.17
PCO_2	44 torr	48 torr
PO_2	60 torr	28 torr
HCO_3^-	18 mEq/L	17 mEq/L
SO_2	85%	50%
Hb	11.4 gms	

Barometric Pressure: 749 torr
FIO_2: .70
IBW: 65 kg
Tidal Volume: 550 mL

Cardiac Output: 4.8 L/min
Heart Rate: 110
Blood Pressure: 118/56
Respiratory Rate: 18

Please calculate the following:

Shift of OHDC? **PaO_2 OF 60 TORR SHOULD YIELD A SATURATION OF 90. BECAUSE THE SATURATION IS LESS THAN THAT, THE CURVE HAS SHIFTED TO THE RIGHT.**

Minute Volume $(\dot{V}_E)$

$$\dot{V}_E = V_t \times f$$

$$\dot{V}_E = .550L \times 18 = 9.9\,L/\text{min}$$

Alveolar Minute Volume $(\dot{V}_A)$

$$65kg \times 2.2\,lb/kg = 143lbs = 143\ mL\ of\ anatomic\ deadspace.$$

$$\dot{V}_A = (V_t - V_d) \times f = (.550\ L - .143\ L) \times 18 = .407\ L \times 18 = 7.33\ L/min$$

Stroke Volume (SV)

$$CO = SV \times HR$$

$$SV = \frac{CO}{HR} = \frac{4.8\ L/min}{110} = 0.044\ L = 44\ mL$$

Mean Systemic Arterial Pressure (MAP)

$$MAP = \frac{(2 \times DIASTOLIC) + SYSTOLIC}{3} = \frac{(2 \times 56) + 118}{3} = \frac{112 + 118}{3} = \frac{230}{3} = 76.67$$

CaO_2

$$CaO_2 = (Hb \times 1.34 \times SaO_2) + (PaO_2 \times .003)$$
$$CaO_2 = (11.4 \times 1.34 \times .85) + (60 \times .003)$$
$$CaO_2 = 12.98 + .18 = 13.16\ vol\%$$

$C\bar{v}O_2$

$$C\bar{v}O_2 = (Hb \times 1.34 \times S\bar{v}O_2) + (P\bar{v}O_2 \times .003)$$
$$C\bar{v}O_2 = (11.4 \times 1.34 \times .5) + (28 \times .003)$$
$$C\bar{v}O_2 = 7.64 + 0.084 = 7.72\ vol\%$$

$C(a-\bar{v})O_2$

$$C(a-\bar{v})O_2 = CaO_2 - C\bar{v}O_2 = 13.16\ vol\% - 7.72\ vol\% = 5.44\ vol\%$$

O_2Del

$$O_2Del = CaO_2 \times CO \times 10$$
$$O_2Del = 13.16\ vol\% \times 4.8\ L/\min \times 10 = 544\ mL\ O_2/\min$$

$\dot{V}O_2$

$$\dot{V}O_2 = (CaO_2 - C\bar{v}O_2) \times CO \times 10$$
$$\dot{V}O_2 = (13.16\ vol\% - 7.72\ vol\%) \times 4.8\ L/min \times 10$$
$$\dot{V}O_2 = 5.44\ vol\% \times 4.8\ L/min \times 10$$
$$\dot{V}O_2 = 261.12\ mL\ O_2/min$$

O_2ER

$$O_2ER = \frac{CaO_2 - C\bar{v}O_2}{CaO_2} = \frac{5.44}{13.16} = .41 = 41\%$$

Q_s/Q_t

$$PAO_2 = [(P_{Baro} - 47) \times FIO_2] - (PaCO_2 \times 1.25)$$
$$PAO_2 = [(749 - 47) \times .70] - (44 \times 1.25) = 491.4 - 55 = 436 mmHg$$
$$Cc'O_2 = (Hb \times 1.34) + (PAO_2 \times .003) = (11.4 \times 1.34) + (436 \times .003) = 15.28 + 1.31 = 16.59 vol\%$$
$$Q_s/Q_t = \frac{Cc'O_2 - CaO_2}{Cc'O_2 - C\bar{v}O_2} = \frac{16.59 - 13.16}{16.59 - 7.72} = \frac{3.43}{8.87} = 0.39 = 39\%$$